	Calculator Prelim Revision 4 - Answers
1	Find the decimal multiplier $100\% - 7\% = 93\% = 0.93$ Use the formula for 3 years $85\,500 \times 0.93^3$ Give both unrounded and rounded answer $68772.5236 = 68\,800\ tonnes$ Full marks can also be awarded for finding the decrease year by year 2019 $85500 \times 0.93 = 79515$ 2020 $79515 \times 0.93 = 73948.92$ 2021 $73948.92 \times 0.93 = 68772.5235$ $68\,800\ tonnes$ No marks will be given subtracting 7% 3 times $85\,500 - 3 \times 5985 = 67545$
2	Substitute t into the formula and set equal to 88 $88 = 4 - 2t$ Solve for t $84 = -2t,\ t = -42$ No marks are given for substituting 88 into the formula $4 - 2 \times 88 = -172$
3	Use the formula for the area of a sector $A = \frac{\theta}{360} \times \pi \times r^2$ Use $360° - 110° = 250°$ for the angle $A = \frac{250}{360} \times \pi \times 26^2$ Give the answer with correct units $A = 1474.8\ cm^2$ 2 marks are available for: • the area of the minor sector $A = \frac{110}{360} \times \pi \times 26^2 = 648.9\ cm^2$ • The arc length of the major sector $Arc = \frac{250}{360} \times \pi \times 2 \times 26 = 113.4\ cm$
4	Give your answer in scientific notation $0.08 \times (3.6 \times 10^{-3}) = 0.000288 = 2.88 \times 10^{-4}\ grams$

5

Mean is $\bar{x} = 154 \div 7 = 22\,°C$

x	x^2
22	484
23	529
25	625
21	441
19	361
24	576
20	400
$\sum$ **154**	$\sum$ **3416**

$x - \bar{x}$	$(x - \bar{x})^2$
0	0
1	1
3	9
-1	1
-3	9
2	4
-2	4
$\sum$ **0**	$\sum$ **28**

Standard deviation is $\sqrt{\frac{3416-\frac{154^2}{7}}{6}}$ $s = \sqrt{\frac{28}{6}} = 2.16\,°C$

The standard deviation is less than $2.3\,°C$, but the mean temperature is not within the given tolerance $(22.04$ to $23.06)$, so the system is not working effectively.

6

(a) $V(\text{cone}) = \frac{1}{3}\pi \times 5^2 \times 6 = \quad 157.079 = 157\text{cm}^3$

(b) Substitute into volume of a cylinder $157 = \pi \times 4^2 \times h$

Calculate the height of the cylinder $h = \frac{157}{16\pi} = 3.123V$, height is $\mathbf{3.1\ cm}$

7

Use the cosine rule $RT^2 = 14^2 + 16^2 - 2 \times 14 \times 16 \times \cos 43$

$RT^2 = 124.3535417\ldots,\ RT = 11.15\ cm$

8

Use 3D Pythagoras in one calculation or two

Space diagonal is $\sqrt{7^2 + 4^2 + 5^2}$ $= \sqrt{90} = 9.49\ cm$

Base diagonal is $\sqrt{7^2 + 4^2} = \sqrt{65}$,

Space diagonal is $\sqrt{\left(\sqrt{65}\right)^2 + 5^2} = \sqrt{90} = 9.49\ cm$

The 10 cm ruler will not fit into this box as $10cm > 9.49\ cm$

9

P and Q are the roots of the equation $x^2 - 6x + 5 = 0$

Factorise $(x - 1)(x - 5) = 0$

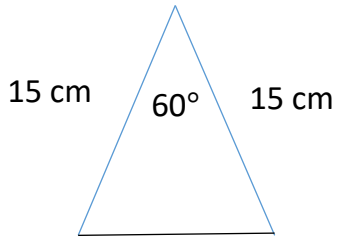
Solve $x = 1,\ x = 5$

State coordinates P $(1,0)$, Q$(5,0)$

The axis of symmetry lies halfway between these roots $x = 3$

No marks will be given for part (b) for axis of symmetry is 3

10 Use the area formula for 6 triangles with dimensions



$$A(\text{one triangle}) = \frac{1}{2} \times 15 \times 15 \times \sin 60$$

$$= 97.4\ cm^2$$

Area of table $= 6 \times 97.4 = 584.4\ cm^2$

3 marks will be given for $A = 6 \times \frac{1}{2} \times 30 \times 30 \times \sin 60 = 2338.3\ cm^2$

11 Correct fraction $\left(\frac{3}{5}\right)^2 = \frac{9}{25}$, laws of indices $(p^4)^2 = p^4 \times 2$, $\left(\frac{3}{5}\boldsymbol{p^4}\right)^2 = \frac{9}{25}\boldsymbol{p^8}$

12

Substitute into the arc length formula	$20 = \frac{65}{360} \times \pi \times D$
Calculate the diagonal	$\frac{20 \times 360}{\pi \times 65} = D,\ D = 35.26\ cm$
Calculate the radius	$r = 35.26 \div 2 = 17.63\ cm$

2 marks will be given for use of area formula $20 = \frac{65}{360} \times \pi \times r^2, r = 5.9\ cm$

13

The height after 30 seconds is	$h(30) = 10 + 6 \sin 30° =$ $\boldsymbol{13\ m}$
Form an equation	$12 = 10 + \sin t$
Rearrange	$\sin t = \frac{2}{6}$
First answer	$t = 19.5°$
Second answer	$t = 160.5°$

14 Minimum value at $(0°, -1)$ and $(360°, -1)$. Maximum value at $(180°, 1)$
x-intecepts at $(90°, 0)$ and $(270°, 0)$, y-intecept at $(0°, -1)$